



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>C12Q 1/68, G01N 33/53</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 98/31839</b> <b>(43) International Publication Date:</b> 23 July 1998 (23.07.98)
<b>(21) International Application Number:</b> PCT/US98/01144 <b>(22) International Filing Date:</b> 21 January 1998 (21.01.98)  <b>(30) Priority Data:</b> 08/786,153      21 January 1997 (21.01.97)      US 08/804,883      24 February 1997 (24.02.97)      US 08/843,623      10 April 1997 (10.04.97)      US  <b>(71) Applicant:</b> PRESIDENT AND FELLOWS OF HARVARD COLLEGE [US/US]; 124 Mount Auburn Street, Cambridge, MA 02138-5701 (US).  <b>(72) Inventor:</b> BAMDAD, Cynthia, C.; 621 Sierra Madre Boulevard, San Marino, CA 91108 (US).  <b>(74) Agent:</b> OYER, Timothy, J.; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>  <b>(88) Date of publication of the international search report:</b> 17 September 1998 (17.09.98)
<b>(54) Title:</b> ELECTRONIC-PROPERTY PROBING OF BIOLOGICAL MOLECULES AT SURFACES  <b>(57) Abstract</b> <p>A technique for immobilizing biological molecules, in particular nucleic acid strands, is described. Biological molecules immobilized at surfaces can be used in electron-transfer detection techniques in which a binding partner of a biological molecule is brought into proximity of the surface-immobilized biological molecule, an electrical potential created between the two biologically-binding species, and electron transfer through the species determined. Another technique involves immobilizing a biological molecule such as a protein, DNA, etc., at a surface via a self-assembled monolayer, affecting the biological molecule via, for example, biological binding, inducing a change in conformation via a prion, etc., and detecting an electronic property change in the molecule via a change in impedance associated with an electronic circuit addressed by the biological molecule. This technique facilitates combinatorial array detection articles.</p> <div style="text-align: right;"> </div> <div style="text-align: right;"> </div>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/01144

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 C12Q1/68 G01N33/53

According to International Patent Classification(IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 93 22678 A (BAYLOR COLLEGE MEDICINE ;HOUSTON ADVANCED RES CENTER (US); MASSACH) 11 November 1993 see whole document, esp. claims and pages 13, line 9 ff	1-12, 19-39
X	CUNNINGHAM B. C. &WELLS J. A.: "Comparison of a structural and a functional epitope" J. MOL. BIOL., vol. 234, - 1993 pages 554-563, XP002071221 see esp. results page 555, 2.column and figure 1a	40
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

13 July 1998

Date of mailing of the international search report

27/07/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Müller, F

# INTERNATIONAL SEARCH REPORT

I. International Application No

PCT/US 98/01144

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 97 44651 A (AUSTRALIAN MEMBRANE & BIOTECH ;UNIV SYDNEY (AU); HARDING MARGARET) 27 November 1997 see whole doc. esp. page 7 ,line 16 - page 8 ,line 19 and claims ---	1-12,20, 36
P,X	WO 97 41425 A (PENCE INC ;UNIV MCGILL (CA)) 6 November 1997 see whole document, esp. claims and figures ---	1-12,20, 36
A	MURPHY C.J. ET AL.,: "Long-range photoinduced electron transfer through a DNA helix" SCIENCE, vol. 262, - 12 November 1993 pages 1025-1029, XP002071222 cited in the application see esp . page 1028, 3. column ---	1-39
A	SIGAL G. B. ET AL.,: "A self-assembled monolayer for the binding and study of histidine-tagged proteins by surface plasmon resonance" ANAL. CHEM., - 1996 pages 490-497, XP002071235 see the whole document ---	13-18
A	"Kinetic characterization of DNA hybridization using real-time BIA" PHARMACIA BIOSENSOR, APPLICATION NOTES, no. 306, - 1994 XP002071223 see the whole document ---	1-39
A	NILSSON P. ET AL.,: "DNA sequencing with BIA" BIA JOURNAL, vol. 2, no. 2, - 1995 page 25 XP002071224 see the whole document ---	1-39
P,A	US 5 620 850 A (BAMDAD CYNTHIA C ET AL) 15 April 1997 see the whole document ---	13-38
A	NGUYEN J. ET AL.,: "Prion protein peptides induce alpha-helix to beta-sheet conformational transitions" BIOCHEMISRY, vol. 34, - 1995 pages 4186-44192, XP002071225 see esp. page 4191, last para. -----	40-51

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/01144

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9322678 A	11-11-1993	EP 0638173 A JP 7508831 T US 5653939 A	15-02-1995 28-09-1995 05-08-1997
WO 9744651 A	27-11-1997	AU 2757897 A	09-12-1997
WO 9741425 A	06-11-1997	AU 2563897 A AU 2563997 A WO 9741424 A	19-11-1997 19-11-1997 06-11-1997
US 5620850 A	15-04-1997	NONE	

**THIS PAGE BLANK (USPTO)**